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(54) **Drill spindle depth adjustment.**

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Description

This invention relates generally to the drilling of holes to a preselected depth, and more specifically to a drill which is utilized for drilling blind holes and which can be adjusted to provide the precise depth of drilling wherein the adjustment can be done externally of the tool and independent of the stroke of the mechanism doing the drilling.

There are many instances where controlled depth of drilling needs to be performed. One specific technology in which controlled depth drilling is required is in the drilling of blind holes in substrate material for the packaging of semi-conductor chips. In this particular technology, a multi-layer circuit board is provided having various levels of circuitry which require vias of different depths to connect with different levels of circuitry.

It has been conventional prior art practice to provide a series or gang of drills operated by a common arm to drill to the desired depth. The conventional practice for adjusting the depth is to provide a very rough adjustment of the depth by means of screwing the drills onto a support collar on a frame and then providing a fine or final adjustment of each drill by adjusting the depth of the socket in the spindle into which the drill bit is to be inserted. Conventionally a set screw or some other type of recessed screw is provided at the end of the socket. In this case, the drill must be completely removed from the set up and this depth screw changed and the drill reinserted to provide for the fine adjustment of the depth of drilling.

When a series of drills are used, there may be frequent requirements for fine adjustment due to various factors during the drilling operation which necessitates frequent down time with excessive delays in removing the specific drill involved, removing the drill bit and adjusting the socket and then reassembling the drill into the rig during which time all drilling is suspended.

There have been many prior art devices which in various manners provide for adjustment of depth of drilling. These include U.S. Patent 4,557,646; U.S. Patent 3,460,408; U.S. Patent 2,402,353; While these patents show various techniques for adjusting the depth of drilling, nevertheless none of them teaches or suggests the specific structure wherein an external adjustment can be quickly made on a drill bit without removing it from the rig and the depth adjusted irrespective of the length of the stroke of the actuating structure.

It is the object of the present invention to provide a drill which can be very quickly and easily fine adjusted externally without dismantling the drill from its support frame to provide final and precise adjustment of the depth to which drilling takes place.

This object is solved by the features given in the main independent claim.

Further typical advantageous embodiments of the present invention are laid down in the subclaims.

According to the present invention, a drilling device for drilling blind holes to a preselected depth in a work piece is provided. The drilling device includes a drill member rotatably driving a spindle which spindle secures a drill bit. Guide means for mounting the drill member for axial movement to perform a drilling operation are provided. A rod member is secured to and extends from said drill member and is movably axially therewith as the drill performs its drilling operation. An adjustable member is threadably mounted on said rod member to provide relative axial movement of said rod member and said adjustable member upon rotation of said adjustment member. Adjusting means are provided connected to the adjustable member and the rod member to rotate the adjustable member with respect to the rod member to thereby cause said relative axial movement of the rod member and the adjustable member. Actuating means are also provided which are connectable to the adjustment member to reciprocally drive said adjustable member between a retracted position and a fully actuated position to thereby provide drive actuation for the drill. Hence, the relative movement of the adjustable member and the rod member will change the fully actuated position of the drill bit upon actuation irrespective of the position of the actuating member.

The invention will be shown in more detail in the following description in accordance with the drawings in which embodiments are shown and in which

Figure 1 is a side elevational view partially in section showing a device according to this invention in a non-drilling actuated position;

Figure 2 is a side elevational view partially in section similar to Figure 1 showing the device of this invention in the retracted position;

Figure 3 is a side elevational view partially in section similar to Figures 1 and 2 showing the device in a drilling actuated position;

Figure 4 is an enlarged longitudinal sectional view of the portion of the device as shown in Figure 3;

Figure 5 is an enlarged longitudinal sectional view of the adjusting mechanism of the device;

Figure 6 is a sectional view taken substantially along the plane designated by Line 6-6 of Figure 5; and

Figure 7 is a sectional view taken substantially along the plane designated by the Line 7-7 of Figure 3.

Referring now to the drawing and for the present Figures 1 through 3, one embodiment of the present invention is shown. The present invention is especially adapted to be utilized as a part of a series of drills all carried by a single frame member, a portion of which is shown and designated as 10. Only one drill is shown in the drawing, it being understood, however, that many other drills can and normally would be

secured to the frame member 10. Frame member 10 normally also mounts an actuating arm 12 which oscillates up and down as indicated by the arrows in Figures 1 through 3 to selectively drive the drill from a retracted position to an actuated position as will be described presently. A single actuating arm with a specifically controlled stroke length is utilized to drive all of the drills. The adjustment of the depth of drilling for each drill thus has to be independent from the actuating arm and the frame 10 and be provided for in each individual drill mechanism or assembly itself.

Each of the drill assemblies includes a drill member 14 which rotatably drives a spindle 16 which in turn mounts a drill bit 18 in an end chuck not shown. The drill is adapted to drill blind holes into a work piece 20 and typically each one of the drills which are mounted on the frame may have to drill holes to a different depth. The drill member 14 may be operated by any conventional means, a preferred type of drill being an air operated drill which is operated by required air and controls designated by the box 22. No particular type of drill and operation thereof is critical, various types of drills being perfectly suitable for use in this particular invention. The drill member 14 is rectangular in shape and mounted for axial movement in a rectangular opening 24 of a drill guide 26 carried by the frame member as can best be seen in Figure 7.

The drill member 14 has a rod member 28 secured thereto and extending axially from the end thereof opposite the spindle. The rod 28 is moveable axially with the drill member 14 in the opening 24. A generally cylindrically hollow adjustment member 30 is provided which has threads 32 threadably engaging threads 34 on the rod member 28. A lug member 35 is also threadably engaged with threads 34 for a purpose which will be described presently. The adjustable member 30 has a tapering upper surface 36 which terminates in a hollow stem 38 projecting upwardly therefrom.

An adjusting member 40 is provided at the end of the rod opposite the drill member 14. As can best be seen in Figures 5 and 6, the adjusting member 40 includes a knob 42 which is rigidly secured to the hollow stem 38 of the adjustable member 30. The adjusting member 40 also includes a cylindrical tooth member 44 having a plurality of circumferencially spaced teeth 46 spaced therearound. The cylindrical member 44 is secured to the rod 28 by means of a set screw 48 and thus is non-rotative with respect thereto. The knob 42 is provided with a spring detent 50 which includes a V-portion 52 positioned to coact with the teeth 46, the detent 50 being secured to the cover by means of a set screw 54. Thus, it can be seen that by rotating the knob 42, the adjustable member 30 will also rotate therewith since the knob 42 is secured to the hollow stem 38 of the adjustable member 30; and, if the rod 28 is maintained stationary as it will be by virtue of the coaction of the rectangular drill 14 and rectangular slot 24, rotation of the knob 42 will cause the adjustable member 30 to move axially relative to the rod 28 by virtue of its threaded engagement to the rod 28 as shown at 34. It should also be noted that because of the detent and tooth wheel construction, incremental movement of the adjustable member 30 with respect to the rod 28 can be accomplished in specific increments depending upon the pitch of the threads at 34 and the spacing of the teeth 46. The purpose of this adjustment will become apparent presently.

Referring again to Figures 1 through 4, a mounting jig 60 is provided for mounting the drill assembly to the frame 10, the mounting jig 60 being secured to the mounting frame by screws 61. As can best be seen in Figure 4, hollow bushing 62 is threadably engaged into the jig 60 which bushing slidably mounts the hollow stem 38 of the adjustable member 30 therein. The lower end of the bushing 62 is provided with a ring of ferro magnetic material 64 such as steel, iron or other magnetizable metal or material. The bushing 62 can be moved vertically within the jig 60 by means of its threaded interconnection and therefore can be moved up and down within the jig 60 and thus be adjusted with respect to its position vis-a-vis to the stationary frame 10 to provide a coarse of rough adjustment of the drilling depth. A collar 66 is secured to the hollow stem 34 of the adjustment member 30 and is provided with a permanent magnet ring 68 at the top thereof which is adapted to coact with the ferro magnetic ring 64 of the bushing 62.

An electromagnet 70 slidably engages the rod 28 and is secured to a mounting plate 72 which in turn is secured by screws 73 to the actuating arm or moveable arm 12 of the drilling rig. The bottom of the adjustable member 30 has secured thereto a ring of ferro magnetic material such as steel, or iron or nickel or the like. Suitable controls designated by the rectangle 76 for operating the electromagnet are provided, the sequence of operation of which will be described presently. A spring 78 is interposed between the collar 66 and the upper surface 36 of the adjustable member 30, and a spring 80 is interposed between the central lug 35 and the bottom surface 82 on the interior of the adjustable member 30. These springs are to provide stability of the various components and compensate for dimensional tolerances of the threads of the adjusting device for the drill during adjustment and the drilling operation. The operation of the drilling device is as follows: As indicated above, normally a whole series of drilling devices are mounted on a stationary frame 10 by means of the jig 60 and mounting bushings 62. A coarse or preliminary adjustment of the vertical portion of the drill with respect to the work piece can be made by positioning of the bushing 62 in the jig 60. The permanent magnet 68 acting against the ferro magnetic ring 64 normally maintains the adjustable member 30 in the position as shown in Figures 1 and 2. Also the electro magnet 70 is normally main-

tained in the de-energized or off position; thus the rotating drill bit 18 is maintained above and out of contact with the work piece 20 by the action of the magnet 68 against ring 64. This is true for all of the drills which are mounted on the frame 10.

The moveable arm 12 oscillates up and down as indicated by the arrows in Figures 1, 2 and 3. However, when the electromagnet 70 is off, the oscillation of the arm 12 will have no effect on the ferro magnetic ring 74 secured to the underside of the adjustment member 30 and thus the oscillation will have no effect on moving the drill member 14 up or down since the rod 28 will be unmoved, the arm 12 moving between the position shown in Figures 1 and 2.

As the work piece 20 is moved into position under the group of drills and it is desired to drill a hole at any specific location, the electro magnet 70 is actuated or energized by means of the controls 76 such that when it reaches the position in Figure 2 the electro magnet will immediately attract the ferro magnetic ring 74. The strength of the electro magnet 70 and the composition of the ring 74 are selected such that the electromagnet 70 will exert a greater force on the ferro magnetic material 74 than the permanent magnetic material 68 exerts on the ferro magnetic ring 64. Thus, when the oscillating arm moves down from the position shown in Figure 2 to the position shown in Figure 3, it will carry the adjustable member 30 with it overcoming the magnetic attraction of the magnetic ring 68 for the ferro magnetic ring 64. Since the adjustment member 30 is secured to the rod 28 by the threaded engagement thereof to the threads 34, the central rod 28 will also move down moving the drill 14 downwardly thus causing the bit 18 to move downwardly and drill a hole in the work piece 20. The drilling continues until the bottom of the stroke of the arm 12 has been reached at which time the moveable arm will be reversed and returned to the position as shown in Figure 2 and the electromagnet 70 de-energized.

The depth to which the drill 18 will drill a hole is dependent upon the amount of movement of the drill 14 which in turn is dependent upon the length of movement of the adjustable member 30 as it is being driven downwardly by the actuating arm 12. This length of movement is in turn a function of the distance between the bottom of the ferro magnetic ring 74 at the position as shown in Figure 1 and the bottom of the stroke of the moveable arm 12. Since the distance of travel of the arm 12 is fixed, the depth is adjusted by moving the relative position of the adjustable member 30 in its position shown in Figure 1. This is accomplished by rotating the knob 42 of the adjusting member 40 as can be seen in Figures 5 and 6. Rotation of the knob 42 in one direction will move the adjustable member 30 axially with respect to the rod 28 in one direction a distance which is a function of the spacing of the teeth 46 and the pitch of the threads 34; conversely rotation in the opposition direction will move the adjustable member 30 in the opposite direction on rod 28. Thus, by rotating the knob 42 the adjustable member 30 also rotates causing rod 28 to move up and down incrementally a small amount with respect to the position of the bottom of the frame 10 and thus change incrementally the location from which the rod 28 starts its downward motion. By changing the location from which the rod 28 starts its downward motion, the dep to which the drill bit 18 penetrates will be changed since the amount of movement of the moveable arm 12 remains constant. Another advantage of this invention allows for incrimental adjustment of each drill in response to many factors which may cause a change in depth of drilling. For example, cam wear, and other machine wear may change the relationship of the frame member 10 and arm 12 over a period of time. This invention provides for adjustment for this wear in an expeditious manner.

Claims

1. A drilling device for drilling blind holes to a preselected depth in a work piece (20), which drilling device has a drill member (14) rotatably driving a spindle (16) which spindle secures a drill bit (18), a mechanism for adjusting the depth to which a hole is drilled comprising,

   guide means (26) mounting said drill member (14) for axial movement to perform a drilling operation;

   a rod member (28) secured to and extending from said drill member (14) and moveable axially therewith,

   an adjustable member (30) mounted on said rod member (28) and selectively moveable thereon to provide relative axial movement of said rod member (28) and said adjustment member (30),

   adjusting means (40) connected to said adjustable member (30) and said rod member (28) to move said adjustable member with respect to said rod member to thereby cause said relative axial movement of said rod member and said adjustable member (30),

   and actuating means (12) connectable to said adjustment member (30) to reciprocally drive said adjustment member between a retracted position and a fully actuated position to thereby provide drive actuation for said rod member (28),

   whereby relative mount of the adjustable member (30) and the rod member (28) changes the fully actuated position of said drill bit upon actuation.

2. A drilling device as defined in Claim 1 wherein said adjusting means (40) includes detent means (50) to move said rod member (28) and said ad-

justment means (30) at preselected incremental distances.

3. A drilling device as defined in Claim 1 or 2 wherein said adjustable member (30) is threadably mounted on said rod.

4. A drilling device as defined in Claim 1, 2 or 3 wherein said adjustment member (40) includes a hollow stem (38) wherein said rod member (28) is mounted within said hollow stem (38) for axial movement therein.

5. A drilling device as defined in Claim 1 to 4 is further characterized by stationary frame member (10),

a bushing (62) mounted on said stationary frame member (10),

said bushing (62) slidably mounting said adjustable member (30) for axial movement with respect thereto.

6. A drilling device as defined in Claim 1 to 5 further characterized by said actuating means including an arm member (12) reciprocally moveable with respect to said stationary frame member (10), and means carried by said moveable arm member and selectively coactable with said actuating member to selectively engage the moves said actuating member responsive to movement of the moveable arm member.

7. A drilling device as defined in Claim 1 to 6 wherein said means (72) carried by said moveable arm member (12) includes electro-magnetic means (70) selectively energizeable and ferro magnetic means (74) carried by said actuating means coactable with said electro magnet.

8. A drilling device as defined in Claim 1 to 7 further characterized by permanent magnetic means (68) carried by said adjustable member (30) and ferro magnetic means (64) carried by said bushing (62) and positioned to normally maintain the actuating means (12) in contact with said bushing means (62) when said electromagnetic means (70) is non-energized;

said electric magnetic means having greater force when energized than the permanent magnet (68).

9. A drilling device as defined in Claim 1 to 8 wherein there are a plurality of drilling devices secured to common actuating means (12).

10. A drilling device as defined in Claim 1 to 9 further characterized by means interposed between said rod (28) and said adjustable member for compensating for dimensional tolerances of said threaded mounting.

11. A drilling device as defined in Claim 1 to 10 wherein said means for compensating for dimensional tolerances of said threaded mounting including lug means (35) mounted on said rod (28), and spring means (80) interposed between said adjustable member (30) and said lug means.

12. A drilling device as defined in Claim 1 to 11 wherein said lug means (35) is threadably mounted on said rod member (28).

Patentansprüche

1. Bohrgerät zum Bohren von Sacklöchern einer vorgewählten Tiefe in ein Werkstück (20), mit einem Bohrteil (14), welches eine Spindel (16) dreht, an der ein Bohrstück (Bohrbit 18) befestigt ist,

mit einer Anordnung zum Einstellen der Tiefe bis zu der ein Loch gebohrt werden soll, welche Anordnung folgendes aufweist:

Führungsmittel (26) zur Führung des genannten Bohrteiles (14) in einer axialen Bewegung zur Durchführung eines Bohrvorganges;

ein Stangenteil (28), welches an dem genannten Bohrteil (14) befestigt ist und sich von diesem Bohrteil aus erstreckt und mit diesem Bohrteil axial bewegbar ist,

ein einstellbares Teil (30), welches an dem genannten Stangenteil (28) befestigt und wahlweise darauf bewegbar ist, um eine relative axiale Bewegung des genannten Stangenteiles und des genannten einstellbaren Teiles zu erzielen,

Einstellmittel (40), die mit dem genannten einstellbaren Teil (30) und dem genannten Stangenteil (28) verbunden sind, um das genannte einstellbare Teil gegenüber dem genannten Stangenteil zu bewegen und dadurch die genannte relative axiale Bewegung des genannten Stangenteiles und des genannten einstellbaren Teiles zu erzielen, und

Betätigungsmittel (12) die mit dem genannten einstellbaren Teil (30) verbindbar sind, um wechselweise das genannte einstellbare Teil zwischen einer Rückzugsstellung und einer vollbetätigten Stellung zu treiben und hierdurch eine Treibbetätigung für das genannte Stangenteil zu erzielen,

wodurch die relative Befestigung des einstellbaren Teiles (30) und des Stangenteiles (28) die vollbetätigte Stellung des genannten Bohrbits (18) bei Betätigung verändert.

2. Bohrgerät nach Anspruch 1, worin die genannten Einstellmittel (40), Einrastmittel (50) zur Bewegung des genannten Stangenteiles (28) und des genannten einstellbaren Teiles (30) in vorgewählten inkrementalen Entfernungen enthält.

3. Bohrgerät nach Anspruch 1 oder 2, worin das genannte einstellbare Teil (30) mittels eines Gewindes auf dem genannten Stangenteil (28) befestigt ist.

4. Bohrgerät nach den Ansprüchen 1, 2 oder 3, worin die genannten Einstellmittel (40) einen hohlen Schaft (38) aufweisen, in dem das genannte Stangenteil (28) zur Erzielung einer axialen Bewegung darin befestigt ist.

5. Bohrgerät nach den Ansprüchen 1 bis 4 ferner gekennzeichnet durch

ein ortsfestes Rahmenteil (10), und

ein Lager (62), das auf dem genannten ortsfesten Rahmenteil (10) befestigt ist,

wobei das genannte Lager (62) unter Zulassung einer gleitenden axialen Bewegung im Lager das genannte einstellbare Teil (30) hält.

6. Bohrgerät nach den Ansprüchen 1 bis 5, ferner dadurch gekennzeichnet,

daß die genannten Betätigungsmittel (12) ein Armglied (12) enthalten, welches in Bezug auf das genannte ortsfeste Rahmenteil (10) hin und her bewegbar ist,

und daß Mittel vorgesehen sind, die von dem genannten bewegbaren Armglied (12) getragen werden und wahlweise mit den genannten Betätigungsmittel (12) in Eingriff gebracht werden können um wahlweise an die Bewegungen der genannten Betätigungsmittel, die durch die Bewegung des bewegbaren Armteiles hervorgerufen werden, angekoppelt werden zu können.

7. Bohrgerät nach den Ansprüchen 1 bis 6, worin die genannten vom genannten bewegbaren Armteil (12) getragenen Mittel (72) elektromagnetische Mittel (70), die wahlweise anschaltbar sind, sowie ferromagnetische Mittel (74), die von den genannten Betätigungsmittel (12) getragen werden und mit dem genannten Elektromagnet zusammen wirken, enthalten.

8. Bohrgerät nach den Ansprüchen 1 bis 7, ferner gekennzeichnet durch

permanentmagnetische Mittel (68), die von dem genannten einstellbaren Teil (30) getragen werden, sowie durch ferromagnetische Mittel (64), die von dem genannten Lager (62) getragen werden und deren Stellung derart ist, daß normalerweise die Betätigungsmittel (12) in Berührung mit den genannten Lagermittel (62) sind, wenn die genannten elektromagnetischen Mittel (70) keinen Strom führen;

wobei die Anziehungskraft der genannten elektromagnetischen Mittel bei Stromdurchfluß durch den Magneten größer sind als die Anziehungskraft des Permamentmagneten (68).

9. Bohrgerät nach den Ansprüchen 1 bis 8 mit einer Vielzahl von Bohrgeräten, die mit gemeinsamen Betätigungsmittel (12) verbunden sind.

10. Bohrgerät nach den Ansprüchen 1 bis 9, ferner gekennzeichnet durch Mittel zwischen dem genannten Stangenteil (28) und dem genannten einstellbaren Teil (30) zur Kompensation von Dimensionstoleranzen der genannten Gewindebefestigung.

11. Bohrgerät nach den Ansprüchen 1 bis 10, worin die genannten Mittel zur Kompensation von Dimensionstoleranzen der genannten Gewindebefestigung eine auf dem genannten Stangenteil (28) befestigte Nase (35) enthalten, sowie eine Feder (80) zwischen dem genannten einstellbaren Teil (30) und der genannten Nase.

12. Bohrgerät nach den Ansprüchen 1 bis 11, worin die genannte Nase (35) mittels eines Gewinde auf dem genannten Stangenteil (28) befestigt ist.

Revendications

1. Dispositif de perçage pour percer des trous borgnes d'une profondeur présélectionnée dans une pièce d'oeuvre (20), lequel dispositif possède un élément de perçage (14) entraînant un mandrin (16) lequel mandrin serre un foret (18), un mécanisme pour ajuster la profondeur à laquelle un trou est percé comprenant :

un moyen de guidage (26) dans lequel est monté l'élément de perçage (14) afin de se déplacer axialement de manière à effectuer un perçage,

un élément tige (28) fixé audit élément de perçage (14) et s'étendant à partir de celui-ci et pouvant se déplacer axialement avec celui-ci,

un élément réglable (30) monté sur ledit élément tige (28) et pouvant être déplacé de manière sélective sur celui-ci pour procurer un déplacement axial relatif dudit élément tige (28) et dudit élément de réglage (30),

un moyen de réglage (40) relié audit élément réglable (30) et audit élément tige (28) pour déplacer ledit élément réglable par rapport audit élément tige provoquant ainsi ledit déplacement axial relatif dudit élément tige et dudit élément ré-

glable (30),

et un moyen de mise en oeuvre (12) pouvant être relié audit élément de réglage (30) pour donner un mouvement de va-et-vient audit élément de réglage entre une position rétractée et une position de mise en oeuvre complète afin de procurer ainsi la commande de manoeuvre dudit élément tige (28), ce par quoi la mise en oeuvre relative de l'élément réglable (30) et de l'élément tige (28) change la position de mise en oeuvre complète dudit foret lors de la mise en oeuvre.

2. Dispositif de perçage selon la revendication 1, dans lequel ledit moyen de réglage (40) comprend un moyen de positionnement (50) pour déplacer ledit élément tige (28) et ledit moyen de réglage (30) à des distances croissantes présélectionnées.

3. Dispositif de perçage selon la revendication 1 ou la revendication 2 dans lequel l'élément réglable (30) est monté par filetage sur ladite tige.

4. Dispositif de perçage selon les revendications 1, 2 ou 3 dans lequel ledit élément de réglage (40) comprend un corps creux (38) et dans lequel ledit élément tige (28) est monté dans ledit corps creux (38) pour s'y déplacer axialement.

5. Dispositif de perçage selon les revendications 1 à 4 caractérisé en outre par un élément cadre fixe (10),

par un manchon (62) montée sur ledit cadre fixe (10),

ledit manchon (62) étant monté de manière à pouvoir coulisser sur ledit élément de réglage (30) pour un déplacement axial par rapport à celui-ci.

6. Dispositif selon les revendications 1 à 5 caractérisé en outre en ce que ledit moyen de mise en oeuvre comprenant un élément bras (12) pouvant être déplacé dans un mouvement de va-et-vient par rapport audit élément cadre fixe (10), et un moyen porté par ledit élément bras mobile et pouvant être mis en coopération de manière sélective avec ledit élément de mise en oeuvre pour s'opposer de manière sélective aux déplacements, ledit élément de mise en oeuvre étant sensible au déplacement dudit élément bras mobile.

7. Dispositif de perçage selon les revendications 1 à 6 dans lequel ledit moyen (72) supporté par ledit élément bras mobile (12) comprend un moyen électromagnétique (70) pouvant être activé de manière sélective et un moyen ferromagnétique (74) supporté par ledit moyen de mise en oeuvre pouvant être mis en coopération avec ledit électro-aimant.

8. Dispositif de perçage selon les revendications 1 à 7 caractérisé en outre par un moyen magnétique permanent (68) porté par ledit élément de réglage (30) et un moyen ferromagnétique (64) porté par ledit manchon (62) et positionné pour maintenir de manière habituelle ledit moyen de mise en oeuvre (12) en contact avec ledit manchon (62) lorsque ledit moyen électromagnétique (70) n'est pas activé ;

ledit moyen électromagnétique ayant une plus grande force quand il est activé que l'aimant permanent (68).

9. Dispositif de perçage selon la revendication 1 à 8 dans lequel il y a une pluralité de dispositifs de perçage montée sur un moyen de mise en oeuvre commun (12).

10. Dispositif de perçage selon les revendications 1 à 9 caractérisé en outre par un moyen interposé entre ladite tige (28) et ledit élément réglable pour compenser les variations dimensionnelles dudit montage par filetage.

11. Dispositif de perçage selon les revendications 1 à 10 dans lequel ledit moyen pour compenser les variations dimensionnelles dudit montage par filetage comprend un moyen de barrette monté sur ladite tige (28) et un moyen faisant ressort (80) interposé entre ledit élément réglable (30) et ledit moyen de fixation.

12. Dispositif de perçage selon les revendications 1 à 11 dans lequel ledit moyen de barrette (35) est monté par filetage sur l'élément tige (28).

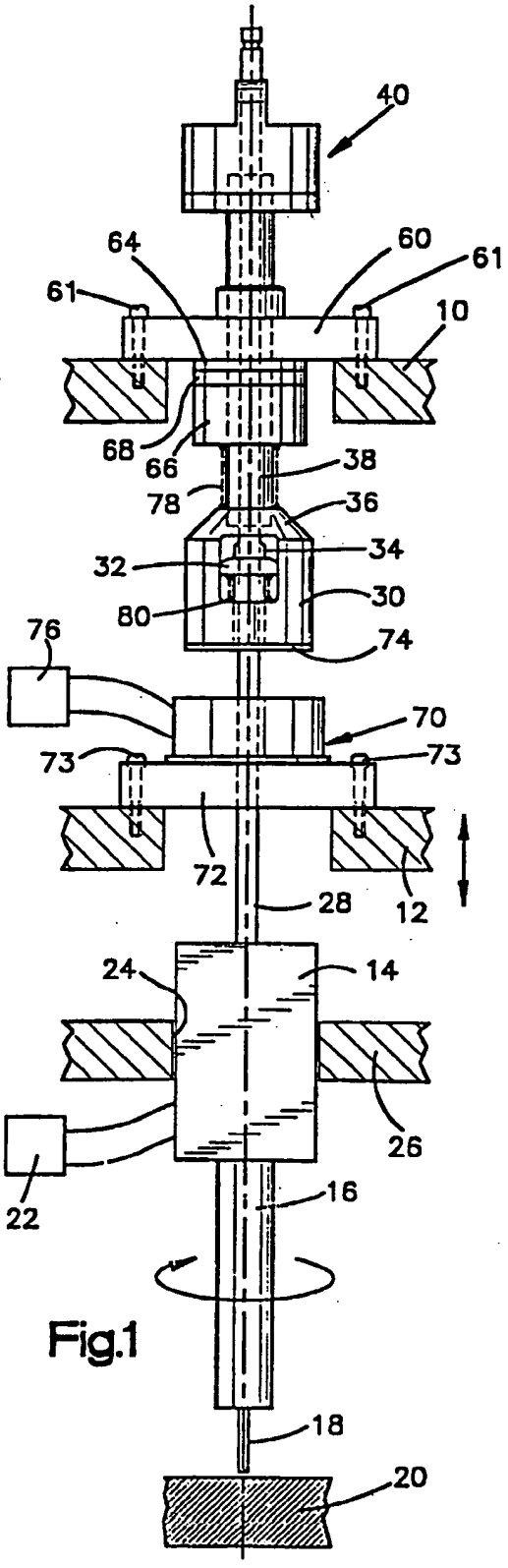
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Fig.1

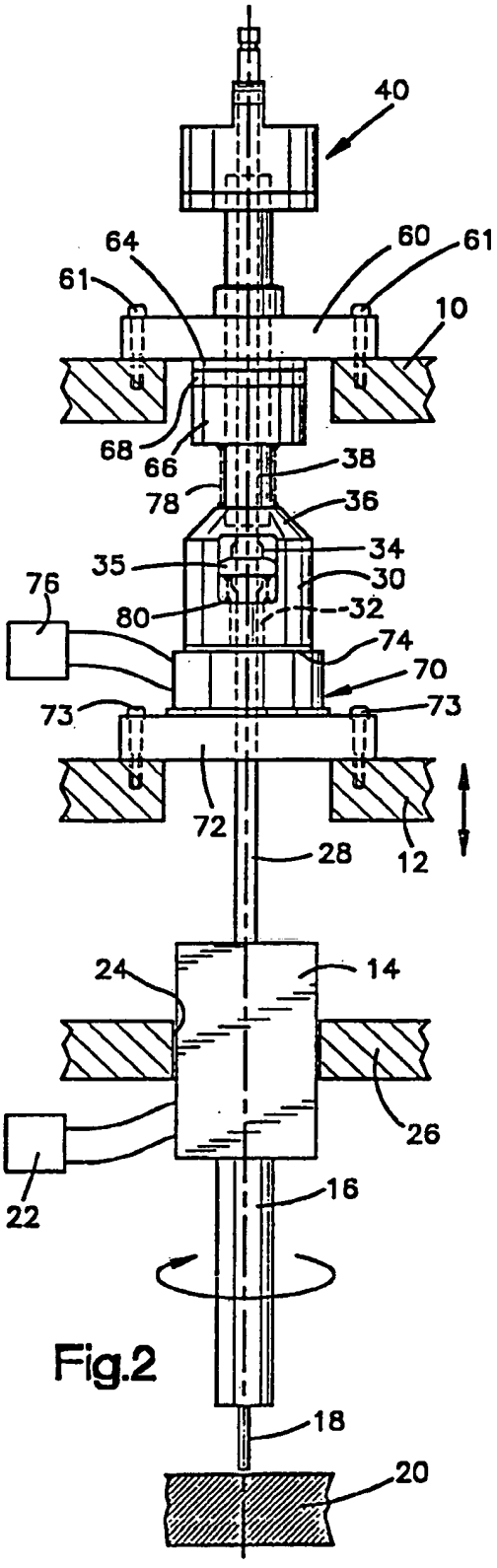
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Fig.2

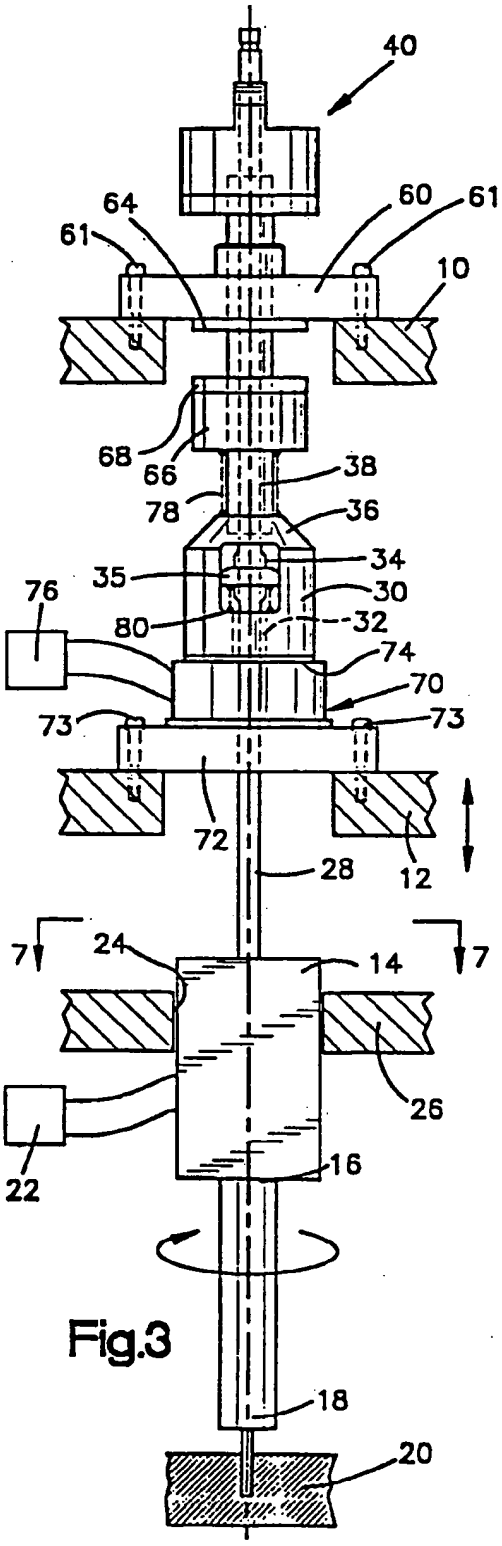
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Fig.3

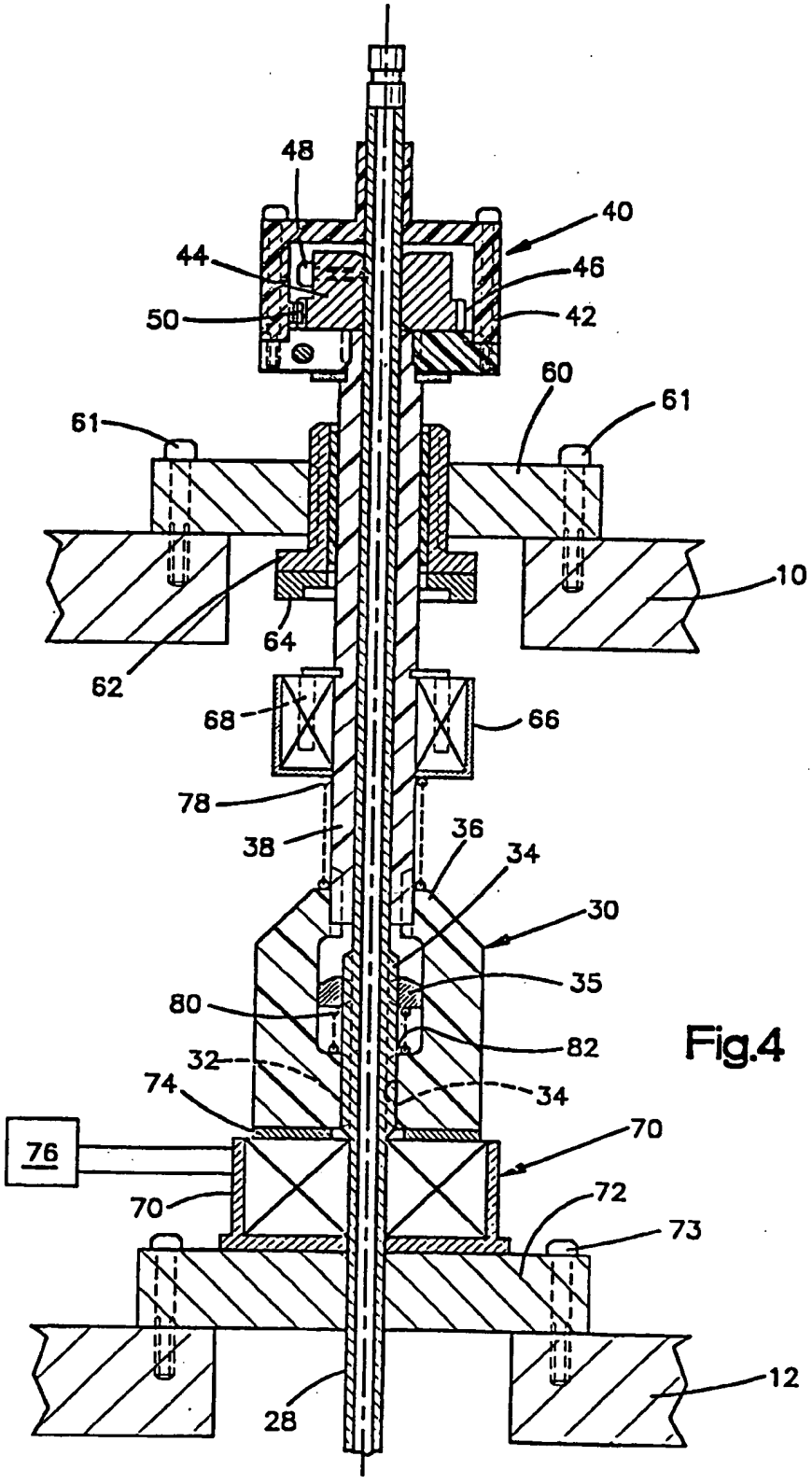
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Fig.4

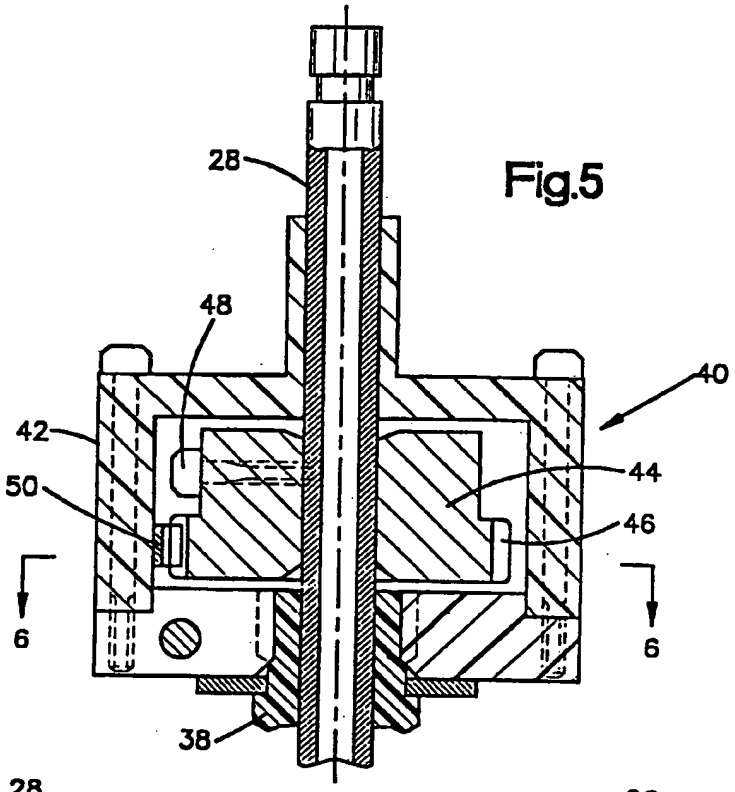

Fig.5

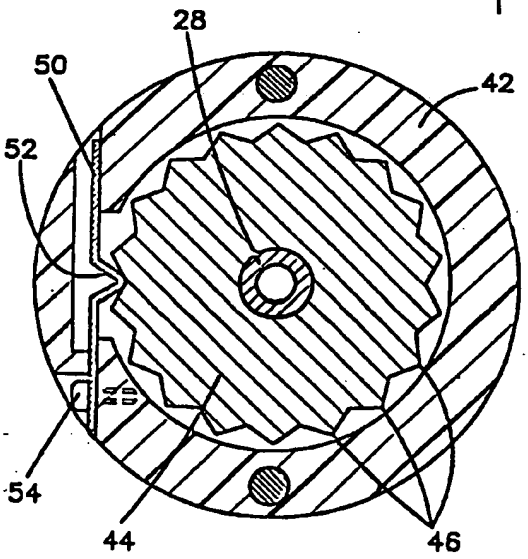

Fig.6

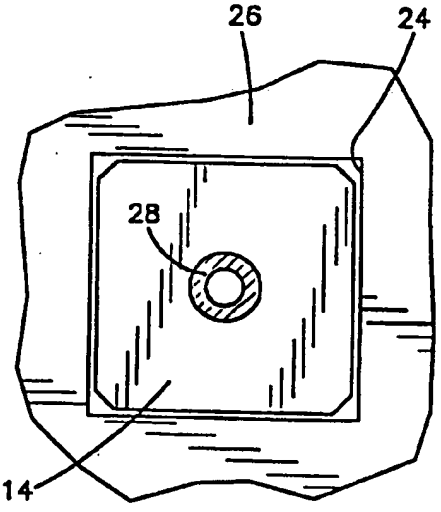

Fig.7